The Systematic Status of Ctiloceras and Some Comparative Genera

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(Plates 1-2, figures 1-35.)

GENERAL DISCUSSION.

In the study of minute gasteropod molluscs the problem of their possible immaturity is for ever present. The peculiar history of *Sinusigera* has served as a warning to conchologists, and has made them perhaps a little too conservative in accepting as generic types shells which are under 2 mm. in size. It will be recalled that certain minute gasteropods of peculiar form were monographed as the genus *Sinusigera*, but were later discovered to be immature and the actual protoconchs of many larger shells belonging to the Thaidae and other families.

Hence a minute shell of curious form collected by the "Challenger" Expedition in dredgings off Cape York was treated cautiously by the monographer R. B. Watson in 1886. He named it *Vermetus*(?) *cyclicum*, but suggested that it be called *Ctiloceras*, at the same time saying that "the creation of a new genus could not really be justified for a shell about which so little was known." In 1902 Hedley used *Ctiloceras* in describing two more species from northern Australia, but he considered them as probably juveniles of larger shells. Since that date additional material has slowly accumulated. In the Australian Museum are some specimens collected by Hedley, Brazier, Henn, Iredale, Mel Ward and A. R. McCulloch, all from Queensland and the Northern Territory, and one imperfect specimen sorted from material collected by A. C. Cameron from northern New South Wales. Now this material has been more than doubled by a large number of specimens collected by John Laseron from Darwin and one of a distinctive species from Thursday Island. This latter material fortunately survived the bombing of Darwin in 1942 and safely reached Sydney to throw much further light on this interesting group. In a brief note Iredale (1943, p. 166) remarked of this material that it contained "at least five distinct groups, each bearing the distinctive apex, which is similar to that of *Caecum*," and stated "if this curious mollusc be restricted to Australian waters, it may class as the Platypus or Lyre Bird of the molluscan world."

It is now the reasoned opinion of the authors that *Ctiloceras* and allied forms now separated as distinct genera are mature shells and not juveniles of larger forms. In the first place they all have a distinctive protoconch terminating in a prominent varix, and the subsequent whorls all have the texture and appearance of maturity, one species at least having the final aperture surrounded by a heavy, double varix. Though all the species here described are minute, the size in each species is constant, the smallest a little over 1 mm., the largest 2.5 mm. This uniformity of size points to maturity, for many of the species are represented by many specimens. In collecting these specimens a great deal of material was examined, and among the thousands of small shells procured it is reasonable to expect some further stage of growth would have been found if indeed such further growth actually occurred. In the whole of Australia no larger shell has been found with an apex similar to *Ctiloceras*, and this apex is so distinctive that it could hardly escape recognition. Amongst the gasteropoda generally the termination of the protoconch is recognised as the final metamorphosis, and though there may be some later change in details of sculpture and growth there is nothing of a radical nature except in some cases a progressive adaptation to a particular environment. For all these reasons we consider not only that *Ctiloceras* and its allies are mature, but also that they comprise a novel and highly specialised group which is worthy of family status. Provisionally and in the absence of further data the group can be designated the Ctiloceratidae. In relationship it may be nearest to the Caecidae.

So far no members of the family have been seen alive, and nothing is known of the animal nor even of the operculum. The shell characters are distinctive. The protoconch is relatively very large, smooth, the apex twisted and tightly coiled in a spiral of 1½ whorls, thence long and conical, more or less curved and terminating in a sharp, raised varix. Mature growth is in the form of a spiral around an open umbilicus; the spire may be quite flat, or it may descend slightly or assume nearly turbinate form. The whorls are few, from 1½ to 2, more or less loosely coiled; the aperture is round and free, and may be simple or expanded, or even terminate in a heavy varix. Sculpture may be either spiral or transverse, or both, or may be nearly absent.

In form the mature shell recalls some of the "Liotiidae," particularly *Liotella*. from which it is at once distinguished by the open coiling and the extraordinary protoconch. The protoconch at once suggests other relationship, particularly with several curious groups with quite different mature shells which have been referred to the Caecidae. *Caecum* itself has a bean shaped mature shell and a similar protoconch which is, however, rarely seen, as it is cast at an early stage and replaced by a mammillate plug. Another group from Australia has previously been identified with *Strebloceras* Carpenter, a European Eocene fossil, but for which later in this paper the new generic name *Pedumicra* is proposed. *Pedumicra* has a similar protoconch to *Ctiloceras*. but the mature shell is in the form of a long, slender, smooth and slightly twisted tube. *Meioceras* Carpenter from the West Indies may be related to *Pedumicra*. It is suggested that these together may be called the Pedumicrinae, but whether they should be linked to the Ctiloceratidae or Caecidae is uncertain. *Parastrophia* de Folin may also come here. *Parastrophia* has a mature shell like *Pedumicra*, but the coiled apex has only half a whorl and there is no varix terminating the protoconch. There is, however, a curious swelling some distance from the apex which may mark the end of the protoconch.

Watsonia de Folin is another curious northern Australian shell of uncertain relationship. In *Watsonia* the fine coiled apex has been cast and replaced by a septum, and there is again no varix to mark the termination of the protoconch. The mature shell is conical and twisted and ends in an expanded aperture surrounded by a heavy varix. The sculpture is of transverse rings. Very like *Watsonia* in mature form is a Queensland shell for which the new genus *Gladioceras* is proposed. Here the coiled apex is also cast and replaced by a septum, but beyond this the protoconch is long, smooth and conical and terminated as in *Pedumicra* by a sharp varix. Provisionally these two genera can be grouped as the Watsoniinae, but again their relationship is uncertain.

The following will then summarise the characters of the four families or subfamilies under discussion.

1. Whole or part of protoconch cast and replaced by plug or septum.
    Whole protoconch cast and replaced by plug, mature shell bean shaped .... CAECIDAE
    Coiled tip only of protoconch cast and replaced by septum, mature shell conical and elongate .... WATSONIINAE
2. Protoconch retained throughout maturity.
    Mature shell conical and elongate .... PEDUMICRINAE
    Mature shell coiled .... CTILOCERATIDAE

In this discussion particular importance has been attached to the protoconch, and it has been used as a basis of wide classification. The taxonomic value of the protoconch varies a great deal, and both of us have pointed out in previous papers the dangers of its too rigid use. It can always be accepted as of specific and sometimes of generic value, but rarely for phylogenetic purposes. Here, however, it is so distinctive that it has become unusually significant, linking together and suggesting relationship between quite a large assemblage of gasteropods. Even so it is not yet known just what part it plays in the life histories of the animals themselves. One of its features is its large size in relation to that of the adult shell, showing that the larval stage is comparatively very prolonged. The presence of a varix also shows that there is an appreciable interval or break in the life history representing the metamorphosis to the adult stage. Whether the larval stage is a free swimming one is not known, but it is probably so. Many of the species of the Ctiloceratidae have a considerable range, some from Darwin to well down the east coast of Queensland. The fact that so far they have not been found beyond Australia is probably due to insufficient collecting and their minute size which makes them easily overlooked. More significant is the fact that *Caecum* with its similar though decollated protoconch has an oceanic range. It is found on the far atolls of the Pacific Ocean, in the Ellice Group, in Hawaii and worldwide elsewhere, and has therefore in its migrations negotiated in some way the vast ocean basins between.

DESCRIPTION OF SPECIES.

In the forthcoming descriptions all recognised species of Ctiloceratidae, previously known or new, are figured and discussed. In addition opportunity has been taken to figure and discuss the species of the other comparative genera mentioned in the general discussion which occur in Australian waters, with the exception of *Caecum*. The latter group is so large and widely distributed that it would need a separate monograph for a review of Australian species only. This has been left for future consideration.

All the material examined, including types and specimens illustrated, which is not already in the Australian Museum, has been presented to that institution.

FAMILY CTILOCERATIDAE.

Key to Genera.

1. Mature shell planoid.
    Sculpture of transverse (axial) ribs .... *Ctiloceras* Watson.
    Sculpture spirally striate to nearly smooth .. *Torresella*, gen. nov.
    Sculpture clathrate .... *Transcopia*, gen. nov.
    Sculpture 2 or more plain spiral keels, axial sculpture confined to summit and base .... *Carinocera*, gen. nov.
    Sculpture of 1 serrated spiral keel, axial sculpture confined to summit and base .... *Jayella*, gen. nov.
2. Mature shell turbinate .... *Enigmerces*, gen. nov.

Genus CTILOCERAS Watson, 1886.

Type-species, *Vermetus*(?) *cyclicum* Watson, 1886, p. 465.

Mature whorls 1½ to 2½, loosely coiled, umbilical aperture large, spire planoid or slightly descending, aperture upright or slightly oblique, protoconch very large and only slightly curved or smaller and strongly curved, aperture with or without a varix. Sculpture of narrow, raised, axial (transverse) ribs surrounding the whorls. Three species are here referred to *Ctiloceras*, but their differences are such, particularly in the aperture and protoconch, that if further species be discovered, they might all be relegated to different genera.

As it is the sculpture keeps them within one easily recognisable group.

Ctiloceras cyclicum (Watson).

(Plate 1, figs. 1 (after Watson), 2, 3.)

Vermetus(?) *cyclicum* Watson, 1886, p. 465, pl. 31, fig. 1.

The type locality is 7 fms. Flinders Passage, Cape York, Queensland. Hedley (1902, p. 22, pl. 2, fig. 28) figured another imperfect specimen collected by J. Brazier from 8 fms. Torres Straits. Another imperfect specimen in the Australian Museum collected by C. Hedley is from the Palm Islands, Queensland. That now figured (fig. 2) is from Darwin, Northern Territory (J. Laseron), and though immature by about half a whorl shows the characters of the species satisfactorily. The essential features are the relatively large protoconch which bends upwards and is quite free from the opposite whorl, the initial open coiling, the flat spire, the summit of the aperture approximately level with the previous whorl, and the sculpture, consisting of regularly spaced, sharp, elevated, transverse rings. The maximum diameter is .9 mm., approximating to 1.3 mm. for the mature shell, which is close to that of the type.

Ctiloceras variciferum, sp. nov.

(Plate 1, figs. 6, 7.)

Shell exceedingly minute, white, solid and opaque. Protoconch of medium size for the family, relatively smaller than in *C. cyclicum*, apex twisted and tightly coiled, thence conical and slightly coiled, terminated by a sharp raised varix. Spire very loosely coiled, flat, practically involute, becoming quite uncoiled towards the aperture. Mature whorls 1½, rounded. Umbilicus wide and open. Sculpture of fine, distant transverse (axial) ribs, completely encircling the whorls, with very fine, spiral striae between. Aperture round, margined by a very heavy varix which in some specimens is doubled. Maximum diameter 1 mm.

Locality.—Hope Islands, Queensland (C. Hedley), holotype and a number of paratypes.

Remarks.—All the specimens were sorted from a tube in the Australian Museum labelled *C. cyclicum* Watson, only one of which was that species. Under the microscope they were easily separated, the smaller size, the uncoiling towards the aperture, the even more involute coiling, the finer sculpture and the heavy terminal varix all being distinctive characters. A single specimen from Angowrie on the north coast of New South Wales, though worn and imperfect, is probably this species, extending the range into the Peronian Province.

Ctiloceras annulatum, sp. nov.

(Plate 1, figs. 4, 5.)

Shell small but large for the group, white, opaque, subturbinate. Protoconch short and stout, strongly curved in the line of the later mature coiling and filling most of the relatively small umbilical opening. Spire descending, at first closely coiled, but becoming free at the aperture. Mature whorls 2½, evenly rounded. Sculpture transverse, numerous, distant, narrow, raised ribs completely encircling the whorls, smooth between, the ridges becoming fainter towards the aperture above but still strong below. Aperture round, without a varix, and slightly oblique downwards. Maximum diameter 3 mm.

Locality.—Van Dieman's Inlet, Queensland (C. Hedley), holotype in Australian Museum (C15377).

Remarks.—This is the largest of the species described, and in its sculpture resembles *C. cyclicum*, but it is much larger, and has a descending spire, it is more tightly coiled, and it differs markedly in the small, highly curved protoconch.

Genus TRANSCOPIA, gen. nov.

Type-species, *Ctiloceras clathratum* Hedley, 1902.

Like *Ctiloceras* in coiling and protoconch, but with sculpture of numerous keels crossed by transverse cords, making the sculpture more or less clathrate.

Transcopia clathrata (Hedley).

(Plate 1, figs. 8 (after Hedley), 9-12.)

Ctiloceras clathratum Hedley, 1902, p. 22, pl. 2, fig. 30.

The type was collected by J. Brazier in 8 fms. in the Torres Straits and the maximum diameter is given as 1.54 mm. Other material in the Australian Museum labelled *clathrata* proved to be another species, but two specimens collected by Mel Ward from 20 fms. off Port Darwin are very close to Hedley's drawing and are without doubt the same species. One is here figured for comparison (figs. 9, 10), its maximum diameter 1.2 mm. A character not mentioned by Hedley but shown in the lateral drawing (Fig. 10) is the slightly descending spire, the summit of the aperture being level with the centre of the preceding whorl. The clathration is also uneven, as it weakens slightly towards the aperture. A series from the shore at Darwin collected by J. Laseron were at first thought to be a different species, but careful comparison beneath the microscope led to the conclusion that they were the same. In this series the axial cords are very faint and only visible in certain lights, so that the clathration practically disappears, but in all other characters they are essentially the same. One with a maximum diameer of 1.4 mm. is here figured (figs. 11, 12).

Genus TORRESELLA, gen. nov.

Type-species, *Ctiloceras striatum* Hedley, 1902.

The shell is flatter and more tightly coiled than *Ctiloceras* and with a translucent vitreous texture. The sculpture is faint, confined to fine spiral striae, and the final aperture is expanded all round.

Torresella striata (Hedley).

(Plate 1, figs. 13 (after Hedley), 14, 15.)

Ctiloceras striatum Hedley, 1902, p. 22, pl. 2, fig. 29.

The type was collected by J. Brazier in 20 fms. off Cape Grenville, Queensland, its maximum diameter 1.36 mm. A specimen collected by J. Laseron (figs. 14, 15) from Darwin was compared with the type, and from it the original description can be amplified, as Hedley did not figure the lateral view. From this it can be seen that the coiling is planoid, the summit of the aperture being well above the previous whorl. The texture also is thin, vitreous and translucent, the surface shining and apparently smooth, the fine spiral striae and very faint axial threads only visible in certain lights under the microscope. It is also somewhat larger than the type, the maximum diameter 2 mm.

Genus CARINOCERA, gen. nov.

Type-species, *Carinocera bicarinata*, sp. nov.

Like *Ctiloceras*, but with a smaller protoconch, and the scultpure primarily of 2 or 3 prominent smooth spiral keels. Axial scultpure when present is discontinuous and confined to the summit of the whorls and the base.

Carinocera bicarinata, sp. nov.

(Plate 2, figs. 16, 17.)

Shell minute, white, solid, slightly translucent. Protoconch comparatively small, slender, the apex small, twisted and tightly coiled, thence smooth, conical, slightly curved, terminated by a sharp raised varix. Mature whorls 1½, slightly descending, the upper margin of the aperture just above the bottom of the preceding whorl, the umbilical opening of medium width above and very wide below. The sculpture is dominated by 2 prominent spiral keels, narrow and raised, forming a platform above and below, and separated by a concave space. This space at first sight appears smooth, but close examination shows that 3 or 4 fine spiral threads are present, much more apparent in some specimens than others. The transverse sculpture is of fairly strong, well separated ribs, which do not quite reach the peripheral keel from above, and which become weak towards the aperture. On the base the ribs are stronger and curve into the umbilical opening. Aperture round, simple and free. Maximum diameter 1.7 mm.

Localities.—5 fathoms off Horsey River, Queensland (C. Hedley), holotype in Australian Museum, C.15116; 20 fms. off Endeavour River, Queensland (A. R. McCulloch); Darwin, Northern Territory (J. Laseron).

Remarks.—The strong double keel and the sculpture generally at once distinguish this from all other species here discussed. No difference could be distinguished between the Queensland and the Darwin specimens except that the former have the threads between the keels a little more distant.

Carinocera sp.

(Plate 2, figs. 18, 19.)

A single specimen, 1.5 mm. in maximum diameter, was sorted from shell sand from Thursday Island, Queensland, by J. Laseron, and though not quite perfect and badly cracked, was obviously different from any other species here discussed. Unfortunately after the drawing was completed it disintegrated under further handling and with it the only material available for description. Under the circumstances no new specific name is proposed, though the figures and description should facilitate recognition at such time when it is rediscovered. The shell is minute, white and translucent. The protoconch is of medium size, slender, slightly curved and terminated by a varix. The spire is flat, the mature whorls 1½, loosely coiled, the summit of the aperture level with the top of the preceding whorl, the umbilical perforation large. The sculpture is of spiral keels, one on the summit and two peripheral, the lowermost wide and rounded, the space between the peripheral keels smooth and concave. Axial sculpture faint and obscure. Aperture imperfect but apparently polygonal. The nearest species for comparison is *C. bicarinata.*

Genus JAYELLA, gen. nov.

Type-species, *Jayella serrata*, sp. nov.

The main characteristic of this genus is the strong, serrated peripheral keel, the serrations appearing broad and rounded from above, but from the lateral view rising at an angle to give the appearance of spines. It is named from the initials of John Laseron who collected so much of the material. Two species have been recognised, one with the spire descending, the other flat and compressed.

Jayella serrata, sp. nov.

(Plate 2, figs. 20, 21.)

Shell minute, white transparent. Protoconch relatively large, elevated, reaching to the margin, the apex tightly coiled, thence tapering, smooth, slightly curved, terminating in a slight varix. Mature whorle 1½, closely coiled, umbilical opening narrow above, the spire descending so that the summit of the aperture is below the base of the preceding whorl. Sculpture predominately of a single, sharp peripheral spiral keel, standing well out from the whorl, broadly serrated at the edge, the serrations bending sharply upwards, appearing spinose from a lateral view. Above the peripheral keel the slope is concave to the summit of the whorl where it is sharply ridged before descending to the suture. Lower surface with a gentle convex curve. The transverse sculpture consists of narrow ribs coinciding with the peripheral serrations, and finally curving into the umbilical opening which is very wide below. Aperture becoming round with maturity, but with a protruding spur marking the termination of the peripheral keel. Maximum diameter 1.5 mm.

Locality.—Darwin, Northern Territory (J. Laseron), holotype and several paratypes.

Remarks.—The scultpure is so striking that this species cannot be readily confused with any other, and the serrations of the peripheral keel make even fragments easy to recognise.

Jayella compressa, sp. nov.

(Plate 2, figs. 22, 23.)

Shell minute, white and translucent. Protoconch of medium size, conforming to the description of other species, terminated by a sharp varix. Mature whorls 1¼ (the holotype may not be quite mature), loosely coiled, the umbilical opening large, the spire flat, the summit of the aperture above that of the preceding whorl. Sculpture of a single strong, sharp, protruding peripheral keel, serrated as in *J. serrata*, the serrations bent sharply upwards and appearing spinose from the lateral view. Above the peripheral keel the whorl is convex to the summit where another slight spiral ridge is also slightly serrated. The whorl below the peripheral keel is concave, the base of the whorl marked by a broad, low, rounded spiral rib. Axial sculpture weak, slight ridges corresponding to the serrations of the peripheral keel, stronger in the early stages, becoming obsolete towards the aperture and barely visible on the base. Aperture becoming rounded with maturity, quite free and separated from the preceding whorl. Maximum diameter 1.5 mm.

Locality.—Buchanan Island, Northern Territory, holotype. Collector unknown.

Remarks.—The only other species with which this can be compared is *J. serrata*. From above the two are nearly similar, the serrated peripheral keel giving them the same facies, though *J. compressa* is more loosely coiled, has a larger umbilical opening and a smaller protoconch. Viewed laterally, however, the differences are very marked, the flat open spire of *J. compressa* and the contour of the whorls being distinctive.

Genus ENIGMERCES, gen. nov.

Type-species, *Enigmerces turbinata*, sp. nov.

Form turbinate, tightly coiled, umbilical opening comparatively small, whorls rounded, sculpture both axial and spiral but weak. Protoconch relatively small, strongly curved.

Enigmerces turbinata, sp. nov.

(Plate 2, figs. 24, 25.)

Shell minute, turbinate, white, translucent to opaque. Protoconch comparatively small, short, strongly curved, the varix slight. Mature whorls 2, closely coiled, round, the umbilical opening narrow above but widening below, the spire descending, the whole aperture quite below the preceding whorl. Sculpture weak, both axial and spiral, the spiral sculpture often only visible when viewed in profile, the axial when viewed from above or below. The spiral sculpture is of numerous fine threads not continuous on the base, the axial of distant, narrow ribs, weak on the summit but stronger on the base where they curve into and plicate the umbilical opening. Aperture free, round and without a varix. Maximum diameter 1.3 mm.

Localities.—Darwin, Northern Territory (J. Laseron), holotype and 2 paratypes; 20 fms. off Port Darwin, N.T. (Mel Ward); 5-10 fms. Hope Islands, Queensland (C. Hedley, No. C27508 in Aust. Museum, labelled *Ctiloceras striatum*); Cape Sidmouth, Queensland (Iredale).

Remarks.—The turbinate form, narrow umbilicus, and small strongly curved protoconch readily separate this from all other species discussed. Throughout its wide range it is remarkably constant, except that some specimens are slightly larger than the type.

SUBFAMILY PEDUMICRINAE.

Genus PEDUMICRA, gen. nov.

Type-species, *Strebloceras cygnicollis* Hedley, 1904.

Protoconch similar to that seen in the family Ctiloceratidae, long, smooth, conical and curved, the apex of 1½ whorls twisted and tightly coiled, the whole terminated by a sharp varix, but the adult shell in the form of a long, thin, conical tube which is slightly twisted, the aperture round, simple and without a varix.

Strebloceras, to which Hedley referred his species *cygnicollis*, is an English Eocene fossil described by Carpenter (1858, p. 440), and first recorded as living by De Folin (1879 and 1886). Carpenter published no figure of his type species, *S. cornuoides*, but his description makes no reference to a varix terminating the protoconch, in this case, considering the great period of time and distance involved, a very important difference. De Folin described *S. subannulatum* from Honolulu (1886, p. 682, pl. 1, figs. 2 and 3), showing a long conical shell with transverse sculpture, but again with no varix terminating the protoconch. No opinion is here expressed as to the identity of the Honolulu species with true *Strebloceras*, though it is considered unlikely, but the Australian species are undoubtedly different and need a new name.

Pedumicra cygnicollis (Hedley).

(Plate 2, figs. 26, 27.)

Strebloceras cygnicollis Hedley, 1904, p. 189, pl. 8, figs. 12-14.

This is the Peronian species the types of which came from Bottle and Glass Rocks and Long Bay, New South Wales, and it has also been recorded from Victoria and South Australia. A specimen collected by Gatliff from Port Albert, Victoria, now in the National Museum, was kindly sent for comparison by Miss Hope Macpherson, and no difference could be detected between it and the New South Wales specimens. That now illustrated is from Port Stephens, N.S.W., its length 5 mm., which is somewhat larger than the type. This may be due to greater maturity, as the length of the protoconch, .6 mm., is approximately the same. Specimens from 17-20 fms. off Masthead Island, Queensland (C. Hedley) are also this species.

Pedumicra queenslandica, sp. nov.

(Plate 1, figs. 28, 29.)

Shell small, thin, glassy and translucent, white to colourless, smooth. Protoconch long and slender, conical, with a fine coiled apex, terminated by a thin varix. Shell characters as in *P. cygnicollis*. Length 2.7 mm., of protoconch .7 mm.

Locality.—15 fms. off Palm Islands, Queensland (C. Hedley, C10237 in Australian Museum), holotype and 2 paratypes.

Remarks.—This would be considered the same species as *cygnicollis* were it not for the protoconch. In actual size the protoconch of *queenslandica* is longer by about one sixth, it is slenderer and has a much finer apex, and the varix is also thinner. Comparison of figs. 27 and 29, drawn to the same scale, will show this difference. No differences could be distinguished in the mature shells. A single specimen from Port Sampson, N.W. Australia is very close to *P. queenslandica*, but has no discernible varix. Further material may show this to be still another species.

Genus PARASTROPHIA de Folin, 1869.

Type-species, *Parastrophia asturiana* de Folin, 1869 Fonds de la Mer, 1, pp. 174, 218.

De Folin separated *Parastrophia* from *Strebloceras* by the protoconch which he states has the apex fine and not twisted, the coiling of only half a whorl, and without a varix. Some distance from the apex there is a slight swelling which may denote the termination of the protoconch. The mature shell is a long conical tube with fine transverse sculpture.

Parastrophia challengeri de Folin.

(Plate 2, fig. 30 (after de Folin).)

Parastrophia challengeri de Folin, 1880, p. 806; 1886, p. 681, pl. 1, fig. 1.

The type locality is 8 fms. off Cape York, Queensland, the length .9 in. or approximately 2.3 mm. This species has not been rediscovered, and further material is needed before its full characters, particularly of the apex, can be given. The original figure in the meantime is here copied for reference. The sculpture is given as transversely and irregularly minutely striate.

Parastrophia ? sp.

(Plate 2, figs. 21, 32.)

A single specimen sorted from shell sand from Michaelmas Cay, Queensland, is doubtfully referred to *Parastrophia*, but if the apex is unbroken it is probably quite distinct and will need a new generic as well as specific name. Under high magnification the apex certainly does not appear broken, as the truncate termination is quite even and appears slightly thickened. For a short distance the shell is then conical and smooth, then it suddenly enlarges slightly and normal growth continues. The mature shell is elongate and conical, slightly curved and twisted, increasing regularly with a simple circular aperture. The sculpture under high magnification is seen as fine, transverse, closely packed threads. The length is 3 mm.

SUBFAMILY WATSONIINAE.

Genus WATSONIA de Folin, 1880.

Type-species, *Watsonia elegans* de Folin, 1880, p. 807.

Again de Folin uses the apex for generic separation, stating that the extreme coiled portion is decollate and replaced by a septum. The form of the elongate shell is conical, curved and slightly twisted, the sculpture is of transverse rings, and the aperture is surrounded by a heavy varix.

Watsonia elegans de Folin.

(Plate 2, fig. 33 (after de Folin).)

Watsonia elegans de Folin, 1880, p. 808; 1886, p. 682, pl. 1, figs. 4-6.

The type locality is 8 fms. off Wednesday Island, Cape York, Queensland, the length given .1 in or approximately 2.5 mm. This is another species which has not been seen since its original discovery, and one of the three original figures is here copied for comparison. The characters are as given in the generic description, and its future recognition should not be difficult.

Genus GLADIOCERAS, gen. nov.

Type-species, *Gladioceras armorum*, sp. nov.

Like *Watsonia* in the form of the adult shell and also in having the coiled apex decollate, but the protoconch thence as in *Pedumicra* smooth and conical and separated from the mature shell by a high, raised varix.

Gladioceras armorum, sp. nov.

(Plate 2, figs. 34, 35.)

Shell small, elongate, conical, white. Protoconch in form like a bayonet, the apex obliquely truncate, any apical whorls probably decollate and replaced by a septum, the remainder smooth and conical, terminated by a very sharp varix. Under strong magnification, the latter two-thirds of the protoconch appear centrally shadowed (fig. 35), suggesting a central cavity. If so the apex is probably quite solidified. Mature shell regularly conical, elongate, slightly curved and twisted, the aperture round and oblique, and encircled by a heavy varix. Sculpture transverse, of fine threads obliquely encircling the shell and separated by about their own width. Length 3.8 mm.

Locality.—Holotype selected from a tube of specimens from 5-10 fms. Hope Islands (C. Hedley, C27502 in Australian Museum).

Remarks.—This is a slenderer species than *Watsonia elegans*, and has quite a different protoconch.

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[*Vermetus* (?) *cyclicus*, p. 465; Caecidae, p. 680.]

The following genera have been proposed as new in this paper: *Carinocera, Enigmerces, Gladioceras, Jayella, Pedumicra, Torresella, Transcopia.*

EXPLANATION OF PLATE 1.

Fig.
1. *Ctiloceras cyclicum* Watson, (after Watson).
2. *Ctiloceras cyclicum* Watson, immature, from above.
3. *Ctiloceras cyclicum* Watson, the same, lateral view.
4. *Ctiloceras annulatum*, sp. nov., holotype, from above.
5. *Ctiloceras annulatum*, sp. nov., the same, lateral view.
6. *Ctiloceras variciferum*, sp. nov., holotype, from above.
7. *Ctiloceras variciferum*, sp. nov., the same, lateral view.
8. *Transcopia clathrata* (Hedley), (after Hedley).
9. *Transcopia clathrata* (Hedley), another specimen, from above.
10. *Transcopia clathrata* (Hedley), the same, lateral view.
11. *Transcopia clathrata* (Hedley), variation, from above.
12. *Transcopia clathrata* (Hedley), the same, lateral view.
13. *Torresella striata* (Hedley), after Hedley.
14. *Torresella striata* (Hedley), another specimen, from above.
15. *Torresella striata* (Hedley), the same, lateral view.

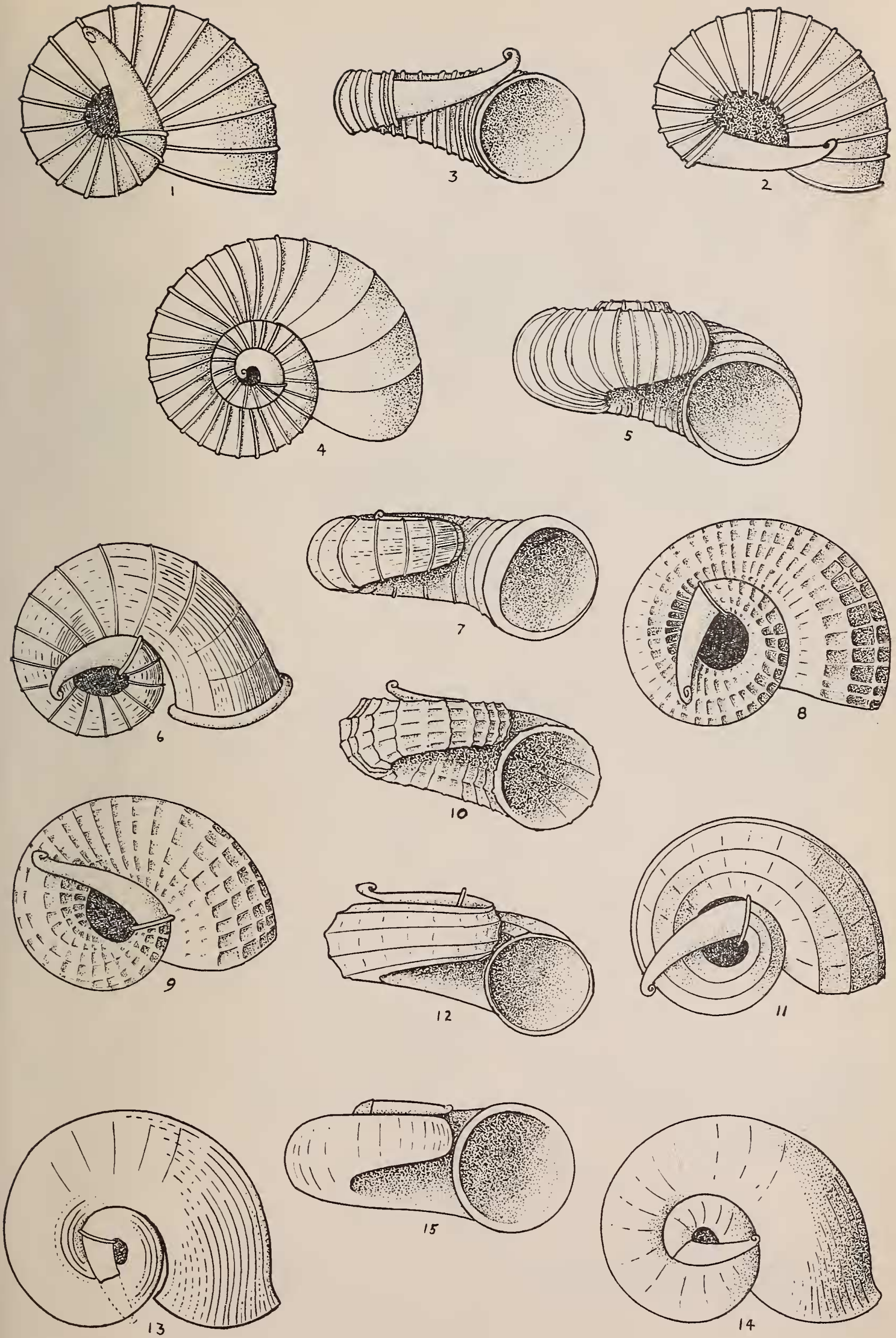

Plate 1.

EXPLANATION OF PLATE 2.

Fig.
16. *Carinocera bicarinata*, sp. nov., holotype, from above.
17. *Carinocera bicarinata* sp. nov., the same, lateral view.
18. *Carinocera sp.*, from above.
19. *Carinocera sp.*, the same, lateral view.
20. *Jayella serrata*, sp. nov., holotype, from above.
21. *Jayella serrata*, sp. nov., the same, lateral view .
22. *Jayella compressa*, sp. nov., holotype, from above.
23. *Jayella compressa*, sp. nov., the same, lateral view.
24. *Enigmerces turbinata*, sp. nov., holotype, from above.
25. *Enigmerces turbinata*, sp. nov., the same, lateral view.
26. *Pedumicra cygnicollis* (Hedley).
27. *Pedumicra cygnicollis* (Hedley), protoconch, further enlarged.
28. *Pedumicra queenslandica*, sp. nov., holotype.
29. *Pedumicra queenslandica*, sp. nov., protoconch, further enlarged.
30. *Parastrophia challengeri* de Folin (after de Folin).
31. *Parastrophia* ? sp.
32. *Parastrophia*, apex further magnified.
33. *Watsonia elegans* de Folin, (after de Folin).
34. *Gladioceras armorum*, sp. nov., holotype.
35. *Gladioceras armorum*, sp. nov., apex, further enlarged.

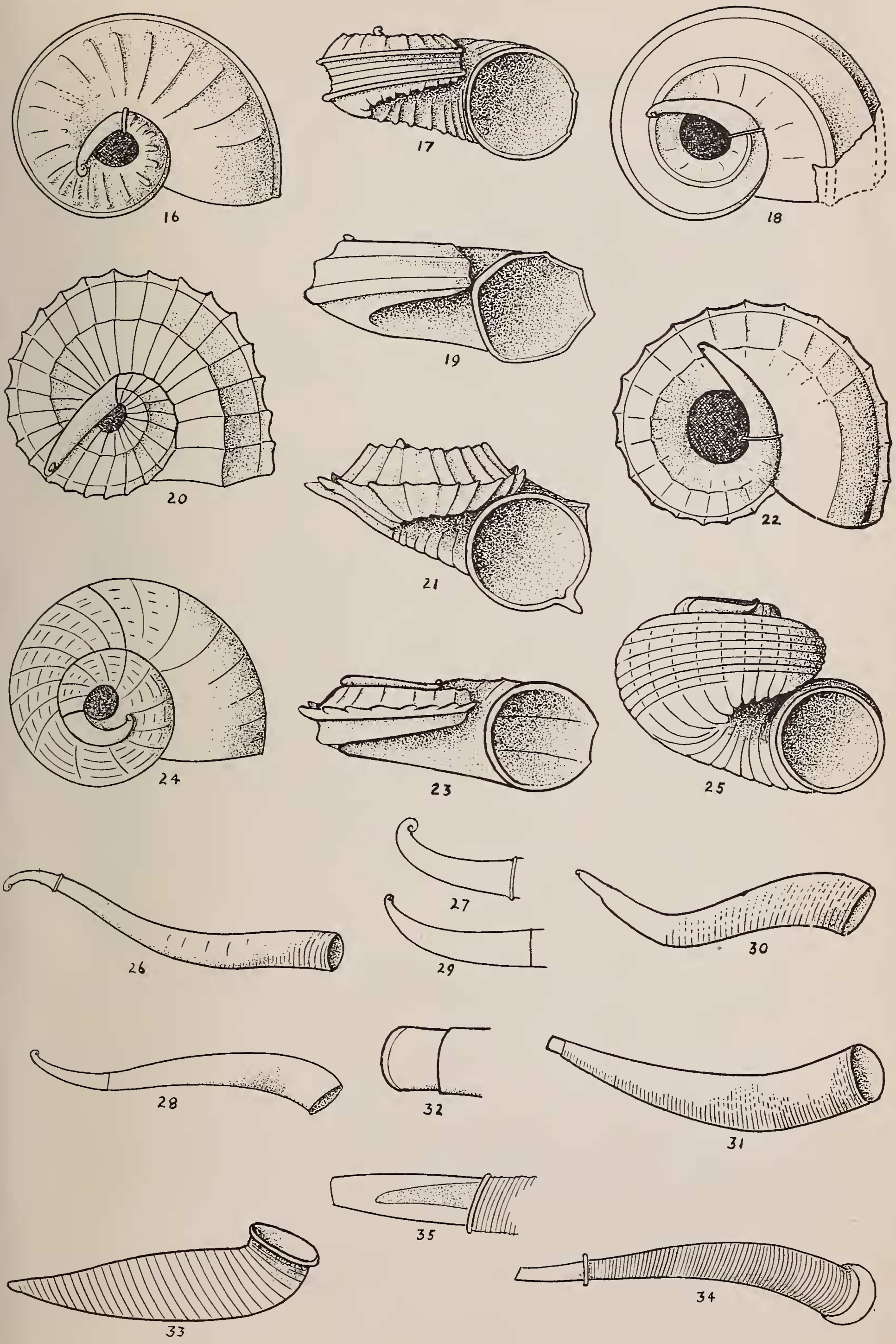

Plate 2.